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NEWSLETTER NOTES

Joe A. McCarty, P.E. (202) 761-8619

This edition of our newsletter is being distributed in electronic format only. Please share it with other mechanical engineers in your organization and with our customers and other professionals that may be interested. We take a quick look at latest developments in POL and hangar fire protection systems. Recent efforts to reduce the design energy targets in the AEI - Design Criteria is a move in recognition of innovations and advancing technologies and to encourage our continuing design of energy efficient, life cycle cost effective facilities. This is in keeping with the emphasis on sustainable design concepts and the Kyoto Protocol discussed on the national news programs and recently signed in Japan. Most importantly, it is consistent with good engineering and economic practices and the best interest of our customers and the taxpayer. Tim Gordon provides an overview of some of our criteria documents and Dan Gentil presents some of the career enhancing training and professional development opportunities available even under funding restraints. Bob DiAngelo takes a look at the problem or alternatives to providing freeze protection for wet pipe sprinkler systems.

As you probably know by now, the E&M Conference has been combined with the dam safety and water quality groups from Civil Works. The joint conference will be held in Kansas City on 2-4 June 1998. Except for a short general session and keynote address for a couple of hours on Tuesday morning, the conference will consist of technical break-out sessions. The agenda is full with presentations by your fellow designers from the district and division offices, a few of us from headquarters and the laboratories and for the first time, several industry representatives. It should be a very worthwhile conference and an excellent opportunity for us to exchange experiences and lessons learned. We are presently reviewing draft papers and they are good. The final papers will be published in the proceedings and handed out at registration to all participants. If you are doing a paper, the

final copy (hardcopy and floppy with the paper formatted in WordPerfect) must be mailed to this address prior to 20 Mar 1998:

U.S. Army Corps of Engineers, Kansas City District,
ATTN: Gerald W. Adams, CENWK-EX
700 Federal Building
Kansas City, MO 64106-2896

Hope to see you in Kansas City.

POL SYSTEMS

Dale Otterness, P.E. (202) 761-8621

The update of NAVFAC Design Manual DM-22, Petroleum Fuel Facilities, and conversion to a military handbook (MIL-HDBK 1022) has been completed. It is to be used by all military services for design of petroleum fuel facilities and is available on the Internet at the Naval Facilities Engineering Command's Southern Division web page. The Internet address is "<http://web.infoave.net/~southdiv/criteria/index.htm#MHPF>". You need "adobe acrobat" to read it, which is available for free downloading at their web site.

A revision to CEGS 13202 to incorporate waste oil storage tanks has been completed. The need for this criteria was brought to our attention at the last E/M Conference and the work was done by CEHNC under last year's criteria update program. This revision will reduce design and construction costs, promote uniformity of construction and satisfies latest environmental requirements for waste oil storage tanks.

SUSTAINABLE DESIGN

Dan Gentil, P.E. (202) 761-8622

Sustainable design means designing, constructing, operating and maintaining facilities in an environmentally and energy efficient manner. Energy conservation is an important and integral part of sustainable design. Energy conservation greatly reduces the environmental pollutants released as a result of producing energy as well as reducing the consumption of nonrenewable natural resources. Sustainable design also includes recycling building materials, reducing waste products during construction and facility operation, and adopting maintenance practices that reduce or eliminate harmful effects on people and the environment. Implementing sustainable design concepts into our projects benefits the installations with reduced operating and energy expenses and reduced disposal/recycle cost at the end of a facility's life.

The Army has developed an Implementation Plan to meet the goals of sustainable design. This Plan includes the Corps in a major way. We need to incorporate the latest technologies and construction practices into the complete planning, design, construction and disposal processes. In addition, Corps designers and other professionals need training in sustainable design concepts and practices. Plans are already being made to include a sustainable design training session into the existing PROSPECT course for HVAC Design Basic. In addition, other PROSPECT courses are being looked at for possible sustainable design training.

Headquarters is directly supporting the sustainable design effort by continuing to update all mechanical and electrical guide specifications to reflect equipment with efficiencies in the upper 25 percent of that

available. In addition, new criteria and guide specifications are being developed to implement energy conserving emerging technologies such as geothermal heat pumps, photovoltaics, desiccant cooling, active solar energy systems, natural gas chillers and fuel cells. Effective methods and practices for using recycled and environmentally friendly materials such as recycled composite railroad ties, waste materials for pavement construction, and other recycled materials and products are also being developed.

Please contact me if you are interested in other information or developments in sustainable design, especially as it relates to energy conservation.

ENGINEERING AND DESIGN CRITERIA PUBLICATIONS

Timothy Gordon P.E. (202) 761-1773

My first impression when I arrived at Corps Headquarters a year ago was that, for the most part, I had heard of all of the engineering and design guidance publications used Army wide. As it turned out, oh boy was I wrong. The number of these publications is overwhelming. But after all this is Washington.

For the benefit of you who are not completely familiar with all of this documentation the following paragraphs are provided. This will take some time but should be useful. Here goes.

The Department of the Army (DA) publications contain three categories. These are Administrative Publications; Doctrinal, Training, and Organization Publications; and Technical and Equipment Publications. The DA publications which provide engineering and design guidance are: Army Regulations (AR), DA Circulars (DA CIR), DA Pamphlets (DA PAM), Numbered HQDA

Letters, DA Technical Bulletins (TB) and DA Technical Manuals (TM).

The DA allows parallel engineering and design guide publications to “address subjects of agency-wide application.” The Corps produces a number of these. The main difference between similar DA and Corps publications is their, “applicability, i.e., an Army Regulation is applicable Army-wide and an Engineer Regulation is applicable Corps-wide.”

The following are established definitions for Corps engineering and design guidance publications:

ENGINEER REGULATION (ER) - provides principles and policies and policy procedures on subjects other than those covered by Army Regulations or provide additional guidance on subjects covered by Army Regulations. Engineer Regulations are publications which direct, indicate or point out.

ENGINEER CIRCULAR (EC) - is a publication dealing with administrative matters, such as status reports. An EC may serve to direct, indicate, or to point out, as applicable, or may be an information only publication.

ENGINEER PAMPHLET (EP) - is an administrative type publication used to provide information such as a publication index.

ENGINEER TECHNICAL LETTER (ETL) - is a temporary directive or informational publication that has a limited distribution dealing with engineering and design matters. An ETL can be mandatory or may be an information only publication.

**ENGINEERING IMPROVEMENT
RECOMMENDATION (EIRS) BULLETIN** - is a publication that contains information, procedures and techniques of a technical or

professional nature for implementation of recommendations through feedback. An EIRS may contain official or unofficial items of an advisory, informative or directive nature.

ENGINEER MANUAL (EM) - provides guidance for the design of facilities for Corps projects. An EM contains general technical and design requirements consistent with established practices for contract administration and permit limited innovation in selected projects.

ENGINEERING INSTRUCTIONS (EI) - provides design criteria and guidance for the Corps of Engineers. Engineering Instructions serve as a guide when planning, programming and designing new construction for military facilities at Army installations.

DESIGN GUIDE (DG) - The DG series govern the design of specific types of facilities such as schools, maintenance shops, physical fitness centers, etc. The design guide covers general criteria, space organization, other guidance for planning, design and evaluation of the particular type of facility. The DG may be mandatory or it may be an optional method for preparing a facility design.

CORPS OF ENGINEERS GUIDE SPECIFICATIONS (CEGS) - provides technical requirements for construction. CEGS are adapted into project specifications which are then combined with the drawings, cost estimates and contract clauses to provide a construction contract. The CEGS are mandatory to the extent that the guide specifications are applicable.

CORPS OF ENGINEERS ABRIDGED GUIDE SPECIFICATIONS (CEAGS) - provides technical requirements for construction of small projects, for repair and maintenance, and for minor elements in larger projects. Like the CEGS, they are

adapted into project specifications which are then combined with drawings, cost estimates, and contract clauses to provide a construction contract. A CEAGS is an optional low-cost alternative to the use of the counterpart CEGS. Users need to be aware that a CEAGS will provide fewer controls (with possible higher risk) than the CEGS.

ARCHITECTURAL AND ENGINEERING INSTRUCTIONS (AEI) - establishes current and uniform criteria and standards for design and development of buildings and facilities at Army installations. There are a total of six documents under this category: Architectural and Engineering Instructions Design Criteria, Medical Design Standards, Installation Support, Project Engineering with Parametric Estimating, Technical Requirements for Milcon Design-Build and Architectural and Engineering Instructions Army Family Housing. These documents include reference materials to be used in the design process, space criteria for buildings, and a system for managing criteria information. One of the documents, AEI Design Criteria, is mandatory for Corps of Engineers design of buildings and facilities other than medical facilities which has its own design standard.

Further details on these publications can be obtained by contacting me at the above phone number. Listing all of this information would significantly lengthen an already long article.

**ENGINEERING AND DESIGN
CRITERIA PUBLICATIONS
FUTURE CHANGES**

Timothy Gordon P.E. (202) 761-1773

Work is now underway to make the Corps' guidance publications more useful for the designer. Improvements to criteria are constantly being suggested but with some publications the time lag is too lengthy. Another drawback with the current publications is with the abridged guide specifications. Preparing these specifications for small projects, for which they are intended, is cumbersome when editing. Two changes to the guidance publications now underway will streamline updating and the editing process.

First, the Technical Manuals (TM) are being changed over to Engineering Instructions (EI). Technical Manuals require strict formatting and a year or more may pass between technical approval and publishing distribution. The fact that TM's are published in hard copy adds to the process time. Additionally, any time a change is required this lengthy procedure has to be repeated.

Engineering Instructions have the following advantages. The Corps adheres to it's own format for EI's. This format is much easier to work with than that of TM's. Also publishing and distribution is quickly done electronically. Changes may be performed right on the "Techinfo" internet website. When an EI is retrieved the user is assured that this is the latest copy.

The abridged guide specifications (CEAGS) are being improved. Work is being done on the SpecsIntact System to allow the designer to efficiently retrieve only the parts of the specification relevant to their project. This is being accomplished at HNC by dividing the

specification down into main subject areas which will be short form specifications. These short form specs will be formed from the parent CEAGS. As an example when the designer retrieves the insulation guide specification CEAGS 15250, other options will appear such as ductwork or piping insulation. The user can then choose to edit only a portion of the specification by selecting the option of say ductwork insulation. All information pertaining to ductwork insulation will then be retrieved in the short form specification.

There are two benefits to this new CEAGS format. The designer will experience significant time saving in not having to search the entire specification if editing is needed in only one area of concern. Finally, only the master specification has to be maintained. The abridged specifications, which are part of the master, will automatically be updated or changed with any modification to the master.

**FREEZE PROTECTION
WET PIPE SPRINKLER SYSTEMS**

Robert DiAngelo, P.E. (202) 761-4803

As a designer, we may be tasked to provide a design that will prevent an existing wet pipe sprinkler system from freezing, without adding heat to a building. A typical case may be a building whose heating system is being shut off or significantly lowered on weekends to save on energy costs. Many engineers consider using heat tape or converting the system to a dry pipe sprinkler system to prevent system freeze. Neither approach is recommended.

Extensive use of heat tape is not reliable and can create a severe fire hazard in the building. The other solution, converting the wet pipe system to a dry pipe sprinkler system is also not usually feasible, except in

small buildings or in small unheated areas of a building. There are problems in converting to a dry pipe system. Some are as follows:

a. Dry pipe systems have a volume limitation of 500 gallons, or 750 gallons with the use of an accelerator device. The reason for the volume limitation is that dry pipe system is tripped (charged with water) when the air pressure in the system is reduced and allows the differential dry pipe valve to open. If the system is too large, the dry pipe valve will take too long to activate. If a system volume is between 500 and 750 gallons, then an accelerator device is required. These devices help speed up the activation of the dry pipe valve. However, these devices are very unreliable and require specialized maintenance. Systems over 750 gallons can not be converted to a dry pipe system, unless they are subdivided into smaller systems. This can be costly and impractical in many cases.

b. Piping of a wet pipe sprinkler systems is not required to be pitched. If a wet pipe system is converted to a dry pipe, the piping would be required to pitched and numerous accessible drains would be required at each low point. Good drainage for dry pipe system is critical. If a pipe section is not properly drained, it will freeze. The cast iron fitting is usually the first to breaks apart, allowing the system to lose air pressure and trip. This event occurs most often during the coldest night of the year, and usually results costly water damages to the building interior and the need for extensive repair to the sprinkler piping. In addition to the piping pitch and drainage, pendant sprinkler heads and piping feeding the pendant heads not allowed in unheated spaces. They must be replaced with dry pendant sprinkler heads which are quite costly.

c. In addition to the miscellaneous equipment needed to convert a system, dry pipe sprinkler system conversions are required to be hydraulically re-calculated.

Converted systems usually require repiping due to increase demands. Per NFPA 13, the design area of sprinkler activation must be increase by 30% without revising the density. The reason for this increase for dry pipe systems is that the fire growth is expected to be 30% larger due to the inherent delay of dry pipe system in getting water on the fire. In addition, the calculated pipe friction is 20% greater for dry pipe systems. For example the Hazen-William C-value is 100 for dry pipe systems using black steel, versus 120 for wet pipe sprinkler systems. It should be noted that piping for dry pipe systems are not allowed to be plastic and must be metallic and approved for dry pipe systems. Because of these increased volume and pressure demands, many times a fire pump will be necessary.

When faced with this requirement, I recommend that the wet pipe sprinkler system be converted to a pre-action system. Pre-action systems are costly, but less costly than conversion to a dry pipe system. Pre-action systems don't have the volume limitation as do dry pipe systems. Pipe pitch and drainage are required for pre-action systems, but are not as critical as compared to dry pipe systems. If a section of the pre-action system freezes, it will not activate the system and cause costly damage. Design area of pre-action systems do not have to be increased, however the Hazen-William C-factor is lowered. The main cost for the pre-action system is that a detection system, preferably a heat detection system, would be required throughout the sprinklered area to activate the pre-action sprinkler system.

If you have any comments or suggestions with respect to this article, please e-mail them to me.

HANGAR FIRE PROTECTION

Robert DiAngelo, P.E. (202) 761-4803

Three ETL's have been recently issued providing criteria and guidance for the design of aircraft hangar fire protection. They are:

- a. ETL 1110-3-481, CONTAINMENT AND DISPOSAL OF AQUEOUS FILM-FORMING FOAM (AFFF) SOLUTION. AFFF fire extinguishing systems are used primarily in aircraft hangars. There has been concern on the environmental impact of AFFF solution discharges, that can occur due to false discharges and testing. These concerns have resulted in costly containment systems, especially in environmentally sensitive areas. The ETL provides information on the hazards of AFFF as well as common sense approach to design of containment systems and handling of AFFF discharges. The guidance of the ETL does not prohibit other engineering methods that meet the intent of the document.
- b. ETL 1110-3-484, AIRCRAFT HANGAR FIRE PROTECTION SYSTEMS. This ETL is essentially an update of ETL 1110-3-411 which has been canceled. The new ETL provides design criteria for protection of hangars that house fixed-wing aircraft. It correlates with recently updated Air Force (AF) criteria. The document also provides procedures for submitting design reviews to the TCX as required by AF criteria.
- c. ETL 1110-3-485, FIRE PROTECTION FOR HELICOPTER HANGARS. The ETL was an update of ETL 1110-3-467 which has been canceled. The major change was to update guidance for wet pipe sprinkler systems using ESFR sprinkler heads.

TRAINING OPPORTUNITIES

Dan Gentil, P.E. (202) 761-8622

In this era of downsizing and shrinking budgets some training/developmental opportunities still emerge that can be beneficial to professionals who are mobile and career-minded. One program recently advertised was the Defense Leadership and Management Program (DLAMP). However, the suspense was so short that only 9 Corps applications were received. The Army had been allocated 123 spaces, but only 45 applicants were actually submitted to the Office of the Secretary of the Army for consideration.

DLAMP was only available to GS-14s and GS-15s on this initial submission. However, a request for new applicants is being planned for this Spring 1998 and should include GS-13 professionals. The DLAMP is a reasonably flexible program because the training and developmental assignments will be intermittent over a six year period. A 3-month, accelerated Senior Service College has been developed to help reduce the time away from your organization, in lieu of the 10-month Senior Service College program. All costs associated with the program will be funded by the DoD, except for half of the participant's salary expense. It is possible that an acquiring agency/organization, benefiting from the temporary developmental assignment, might be willing to pay for the other half of the participant's salary expense. There are extensive forms to be filled out and certain Executive Core Qualifications must be addressed in each DLAMP applicant's package. An idea of what DLAMP is all about can be found at certain web sites including "<http://www.dfas.mil/people/hrdlmp.htm>." Another useful web location with training information is available at "<http://www.cpol.army.mil/>." One feature that I like about DLAMP is that once you

are selected, a mentor will be assigned to work with you in planning and developing your career.

Other training opportunities also occasionally appear at minimal or no cost, such as the recent CRREL "Geothermal Heat Pump Design" workshops and the DOE Federal Energy Management Program (FEMP) workshops that include "Energy Savings Performance Contracting", "Designing Low Energy Buildings", "Life Cycle Costing" and numerous others. In addition, training is often available to Federal employees at minimal or no cost at locations such as the Air Force Institute of Technology (AFIT) at Wright Patterson Air Force Base, and the graduate school extension at the U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. These courses may be available on a space-available basis and often offer college graduate credit.

I have related only a few opportunities that exist and can be obtained at minimal or no cost. These opportunities are also flexible enough to offer minimal impact on the mission. If anyone is aware of other low cost/no cost training resources please relate them to us so they can be included in a follow-up newsletter article. If you should need further information, please do not hesitate to contact me.

DESIGN ENERGY TARGETS

Dan Gentil, P.E. (202) 761-8622

In recent official correspondence dated 2 December 1997, the Energy Use Budget (EUB) values in the Architectural and Engineering Instructions (AEI), Design Criteria, Chapter 11, have been reduced by 10 percent. This interim change is effective now.

The interim reduction in EUB values is necessary to ensure that all Corps designs reflect energy efficient facilities that comply with Federal regulations and executive orders. The effort to further reduce energy consumption is consistent with an increased emphasis on energy conservation, sustainable design practices, and important environment concerns. In some cases, it may be difficult to design within the established EUB values; however, every effort must be made to include as many life-cycle-cost-effective energy conservation measures as possible. In accordance with the Corps AEI, when the DEU cannot be designed within the EUB, a formally documented waiver must be requested from the Major Subordinate Command, and an information copy must be furnished to Headquarters, CEMP-ET. It is imperative that all documentation be accurately described, be complete, and maintained in a permanent project file. In a recent DoD Inspector General audit, this documentation was found to be woefully lacking.

Should further information concerning this EUB update be necessary, please do not hesitate to contact me.

HEAT DISTRIBUTION SYSTEMS

Dale Otterness, P.E. (202) 761-8621

New Specification for Buried High Temperature Systems:

In order to satisfy Federal Acquisition Regulations, the prequalification process for procurement of Underground Heat Distribution Systems must be discontinued. We have prepared a new guide specification CEGS 02695, PRE-ENGINEERED UNDERGROUND HEAT DISTRIBUTION SYSTEM, intended for procurement of buried high temperature systems. It is available on TECHINFO from the Corps

Huntsville Support Center. The Internet address is "http://www.hnd.usace.army.mil/techinfo/cegs/02695.pdf ". You need "adobe acrobat" to read it, which is available for free downloading at the TECHINFO site. In lieu of the prior prequalification procedure, new thermal performance testing will now be required in section 3. Dr. Gary Phetteplace (603-646-4248) at the Corps Cold Regions Research and Engineering Laboratory prepared this section and should be able to answer any questions. It should be remembered that Army AR 415 and Corps policy require that buried high temperature systems are only to be used in sites where aboveground or shallow concrete trench systems cannot be used.

Infrared Surveys:

Funds have been provided for the Corps Cold Regions Research and Engineering Laboratory (CECRL, POC: Dr. Gary Phetteplace, 603-646-4248) to conduct infrared surveys of existing heat distribution systems at several Army installations during FY 98. The infrared technique is a valuable tool for determining condition of existing systems. Surveys provide a summary of the relative heat being lost by individual segments of buried systems. Installations can use this information to establish priorities for future efforts to improve the efficiency of their heat distribution systems. Because results are very dependent on an accurate determination of pipe depth, the lab will be investigating utility locators to find a more accurate method of determining depths. Specific installations are being selected and suggested locations from Corps offices are welcome. Funding is limited but an opportunity exists for Corps offices to suggest to their installations that funding for an infrared survey would be beneficial to the installation.

No More FRP for Condensate Return Systems:

Based on results from Construction Engineering Research Laboratories' (CERL) survey of condensate return systems with fiberglass carrier pipe, it has been determined that fiberglass pipe will not be used for these systems. The POC for this survey was Dr. Charles Marsh, CECER, at 217-373-6764. Action has been taken to eliminate the fiberglass pipe from the guide specifications. Because of the highly corrosive nature of condensate, only schedule 80 steel pipe will be allowed.

HEATER Engineered Management System:

CERL is currently developing the HEATER Engineered Management System (EMS), a software package for helping installations manage their heat distribution systems. HEATER helps identify and prioritize current and future maintenance and repair needs through its inventory, inspection, condition assessment/ index, condition prediction, and maintenance and repair planning procedures. HEATER interfaces with HeatMap, which provides flow, pressure, temperature, and heat loss analysis of the distribution system. The result is a tool that provides comprehensive assistance with design, operation, maintenance and repair of heat distribution systems. HEATER and HeatMap both run in the Windows 95 or Windows NT operating system. HEATER will be discussed in detail at the Utilities Engineered Management System workshop (co-hosted by CECPW and CERL) which is being planned for mid-February in the Washington area. In addition, CERL is looking for a few installations that might be interested in testing the program and/or providing review comments. If you are interested in attending the workshop, in helping test HEATER/ HeatMap or know of installations that may be interested please contact Vicki Van Blaricum, CECER-FL-M, at 217-373-6771.